

## 6.5 Wetland Programs

***Wetlands are important to the Nation's environment. Wetlands can store floodwater, trap nutrients and sediment, help recharge ground water, provide habitat for fish and wildlife, and buffer shorelines from wave damage. Wetlands can also provide outdoor recreation, produce timber, provide grazing for livestock, and support educational and scientific activities. Despite these public values, conserving land as wetland forecloses more intensive economic uses for landowners. Differences between public and private interests in wetlands provoke controversy over wetland programs and policies.***

### Contents

- ***Wetland Status and Trends ..... 310***
- ***Wetland Incentives and Programs ..... 316***
- ***Impacts of Proposed Changes to  
Wetland Programs ..... 320***

**W**etland status involves both the extent or quantity of wetlands and the functions or quality of wetlands. Most policy interest has been focused on the extent of wetlands remaining and the rate of conversion from wetlands to other uses. However, as wetland loss rates decline, quality aspects are receiving increasing attention.

### Wetland Status and Trends

Almost half of U.S. wetland acreage has been converted to other uses since colonial times. Current policy is attempting to balance wetland losses and wetland restoration, with the long-term goal of achieving a net gain in wetlands that would partly reverse the historic decline.

#### Wetland Extent

Estimated wetland extent in 1992 was almost 124 million acres in the contiguous 48 States (including an estimated 12 million acres of Federal wetlands), just over half of the wetlands present in 1780 (table 6.5.1). An additional 170 million acres of wetlands exist in Alaska and Hawaii, down slightly from colonial times. Absolute losses of wetlands since 1780 have been greatest in Texas, Florida, Minnesota, Illinois, Arkansas, North Carolina, and Louisiana, ranging from 5 to 10 million acres each. Nine States

experienced a 70-percent or greater loss in wetland extent since 1780, and 9 more lost more than 50 percent of original wetlands. Net gains posted for some States may be due to underestimates of original wetlands, or represent real gains through incidental or intentional wetland creation or restoration associated with water impoundments and other projects. Remaining wetlands are concentrated in Florida, along the southeastern and gulf coasts, and in the northern Lake and Plain States (fig. 6.5.1).

The greatest loss of wetlands occurred between colonial times and the early decades of this century, with most occurring since 1885 (Pavelis, 1987). Average annual rates of wetland conversion have generally been falling since the first reliable scientific inventories were taken in the mid-1950's.<sup>1</sup> Between 1954 and 1974, the net rate of wetland conversion averaged 457,600 acres per year, with 81 percent of gross wetlands conversion to agricultural uses and 8 percent to urban (table 6.5.2, fig. 6.5.2). Between 1974 and 1983, net wetland conversion dropped to 290,200 acres per year; gross conversions to agricultural use accounted for 53 percent and urban

<sup>1</sup> Available data on wetland conversion are from three studies using different statistical sampling techniques on slightly different wetland universes.

**Table 6.5.1—U.S. wetlands extent and losses, by States 1780's-1992<sup>1</sup>**

State <sup>1</sup>	1780's <sup>2</sup> extent <sup>2</sup>	1992 <sup>3</sup> extent <sup>3</sup>	1780-92 losses <sup>4</sup>	
	<i>Thousand acres</i>			<i>%</i>
Texas	16,000	5,656	10,344	65
Florida	20,325	11,251	9,074	45
Minnesota	20,135	11,738	8,397	42
Illinois	8,212	1,361	6,851	83
Arkansas	9,849	3,140	6,708	68
North Carolina	11,090	5,259	5,830	53
Louisiana	16,195	11,195	5,000	31
Indiana	5,600	769	4,831	86
Mississippi	9,872	5,675	4,197	43
Ohio	5,000	937	4,063	81
Missouri	4,844	985	3,849	80
Alabama	7,568	3,737	3,830	51
Michigan	11,200	7,454	3,746	33
Wisconsin	9,800	6,546	3,254	33
California	5,000	1,901	3,099	62
Iowa	4,000	1,183	2,817	70
South Carolina	6,414	3,878	2,536	40
Oklahoma	2,843	497	2,345	83
Nebraska	2,910	1,206	1,705	59
Colorado	2,000	691	1,309	65
Tennessee	1,937	806	1,131	58
Kentucky	1,566	447	1,119	71
North Dakota	4,928	3,825	1,103	22
Wyoming	2,000	932	1,068	53
Maine	6,460	5,522	938	15
Oregon	2,262	1,430	832	37
New Jersey	1,500	700	800	53
Arizona	931	231	700	75
New Mexico	720	84	636	88
Maryland	1,650	1,028	622	38
South Dakota	2,735	2,144	591	22
Washington	1,350	1,012	338	25
Connecticut	670	361	309	46
Massachusetts	818	594	224	27
Delaware	480	263	217	45
Pennsylvania	1,127	948	179	16
Nevada	487	326	161	33
Virginia	1,849	1,727	122	7
West Virginia	134	99	35	26
Rhode Island	103	96	7	6
Idaho	877	926	(49)	(6)
Kansas	841	915	(74)	(9)
Georgia	6,843	6,956	(113)	(2)
Montana	1,147	1,363	(216)	(19)
New Hampshire	220	476	(256)	(116)
Vermont	341	710	(369)	(108)
Utah	802	1,247	(445)	(56)
New York	2,562	3,718	(1,156)	(45)
48-State total	221,130	123,945	97,184	44
Hawaii	59	52	7	12
Alaska	170,200	170,000	200	0
U.S. total	391,389	293,997	97,391	24

<sup>1</sup>Ranked in order of absolute loss. <sup>2</sup>Based on estimates by Dahl, 1990. <sup>3</sup>Based on 1992 National Resources Inventory estimates totaling 111.4 million wetland acres on nonfederal land in the 48 States, adjusted upward to include an estimated 12.5 million acres of wetlands in Federal ownership derived from the locations of U.S. Fish and Wildlife Service National Wetland Status and Trends Analysis samples. Estimates for Hawaii are 1992 NRI and estimated Federal wetlands. Alaskan estimate is for 1980 from Dahl, 1990. <sup>4</sup>Wetland gains in eight States may be due to low estimates of 1780's wetland extent or real wetland gains since 1780. Source: USDA, ERS estimates based on Dahl, 1990 and 1992 National Resources Inventory data (see footnotes).

## What is a Wetland?

Since 1977, the Federal Government has used a three-part wetland definition involving soils, vegetation, and hydrology. According to the U.S. Army Corps of Engineers (ACE), wetlands are "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." While the definition of wetlands has not changed over time, the precise guidelines for deciding what land meets that definition, called delineation criteria, have been controversial because of conflicts between landowners who want to use and develop wetland areas and environmentalists who want to preserve them.

After interagency attempts to develop a manual for delineating wetlands in 1979, 1987, 1989, and 1991, a National Research Council committee was convened in 1994. Its report rejected the idea that all three indicators (soil, water, and vegetation) must be present and defended the use of one or two of the indicators to infer the presence of the third (NRC, 1995). It urged development of regional standards and protocols for delineation that recognize the diversity of wetlands and stressed the need for functional assessment in regulatory delineation.

Field tests of the latest manuals indicated that 30 to 80 percent of wetlands delineated in the 1989 manual would be excluded by the 1991 manual. Field evaluations in the fall of 1995 indicated that wetlands would be reduced 60 to 75 percent if proposed congressional revisions to wetland delineation are enacted.

uses for 3 percent (38 percent converted to other uses was cleared and drained, possibly intended for agricultural use). Between 1982 and 1992, the net rate of wetland conversion further dropped to 79,300 acres per year, with agriculture accounting for only 20 percent of gross wetland conversions and urban uses for 57 percent. Over half of all wetland losses between 1982 and 1992 were from forested wetlands or wetlands on forest land.

Conversion back to wetlands has increased from 1 acre for every 3 lost in 1954-74 to 1 acre for every 2 in 1982-92. Deepwater (permanently flooded lands) provided two-thirds of wetland gains in 1982-92 and former agricultural land provided 10 percent. In addition to abandonment, natural reversion, and

Figure 6.5.1--Distribution of wetlands on rural nonfederal land, 1992

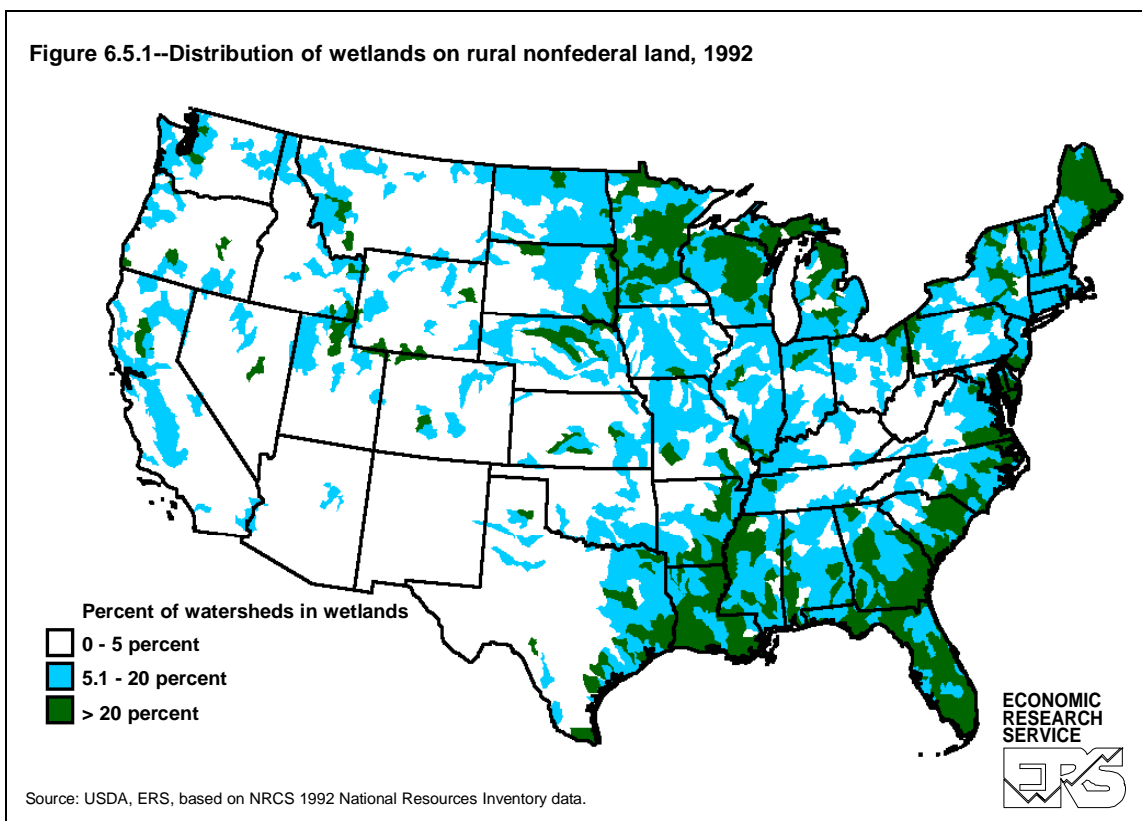
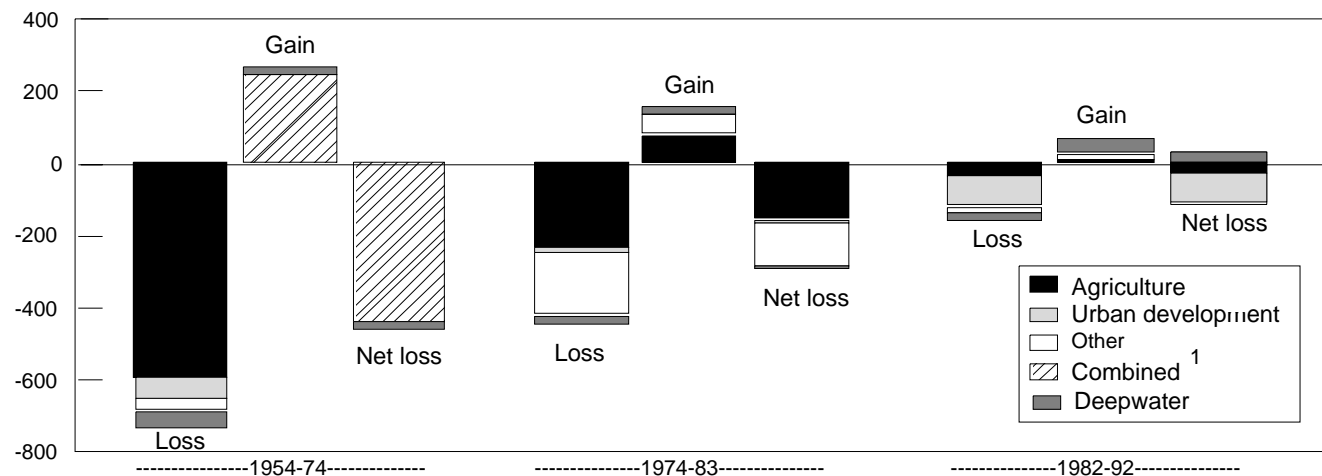


Figure 6.5.2--Change in wetland acreage by use, 1954-1992

Thousand acres per year



<sup>1</sup> Combined agriculture, urban development, and other. Separate data not available.

Source: USDA, ERS, based on (for 1954-84) USDI, National Wetland Status and Trend Analysis; and (for 1982-92) NRCS, National Resources Inventory data.

**Table 6.5.2—Average annual wetland conversion, contiguous States, 1954 to 1992**

Item	USDI, Fish and Wildlife Service estimates <sup>1</sup> (Includes Federal lands)				USDA, NRCS estimates <sup>2</sup> (Excludes Federal and urban lands)	
	1954-74 change		1974-83 change		1982-92 change	
	1,000 acres/yr.	Percent	1,000 acres/yr.	Percent	1,000 acres/yr.	Percent
Wetlands converted to:						
Agriculture	592.8	81	234.8	53	30.9	20
Urban development	54.4	8	14.0	3	88.6	57
Other	35.3	5	168.1	38	16.4	10
Deepwater	47.6	6	29.0	6	20.2	13
Total	730.1	100	445.9	100	156.1	100
Converted to wetlands from:						
Agriculture			81.5	53	41.8	54
Urban development	247.8 <sup>3</sup>	913	.4	0	1.5	2
Other			53.4	34	28.8	38
Deepwater	24.7	9	20.4	13	4.8	6
Total	272.5	100	155.7	100	76.9	100
Net change in wetlands <sup>4</sup> :						
Agriculture			153.3	53	-10.9	-14
Urban development	434.7 <sup>3</sup>	953	13.6	5	87.1	110
Other			114.7	40	-12.4	-16
Deepwater	22.9	5	8.6	2	15.4	20
Total	457.6	100	290.2	100	79.3	100

na = not available. <sup>1</sup> U.S. Fish and Wildlife Service, National Wetland Status and Trends Analysis, mid-1950's to mid-1970's and mid-1970's to mid-1980's. Excludes Alaska and Hawaii. <sup>2</sup> Soil Conservation Service, USDA, National Resources Inventories, 1982 and 1992. Includes only nonfederal land. Excludes Alaska; includes Hawaii and Caribbean. Wetlands exclude deepwater habitats. <sup>3</sup> Includes agriculture, urban development, and other. Separate estimates not available. <sup>4</sup> Conversion of wetland to nonwetland uses, plus increases in wetlands due to restoration, abandonment, and flooding. Excludes change to or from Federal ownership. Source: USDA, ERS compilation of available data, see footnotes.

private activity, wetland gains resulted from restoration programs such as the joint ventures sponsored under the North American Waterfowl Management Plan, Fish and Wildlife Service's Partners for Wildlife program, mitigation required under Section 404 of the Clean Water Act, and the efforts of private groups such as Ducks Unlimited.

Wetland losses vary throughout the country. Gross wetland losses were greatest along the east coast, Great Lakes, and Gulf Atlantic States, especially Louisiana, Florida, and North Carolina (fig. 6.5.3). Losses were more moderate in the Pacific Northwest. Thus, while net losses of wetlands are greatly reduced, certain areas of the country and certain wetland types are still experiencing significant losses.

### **Wetland Quality**

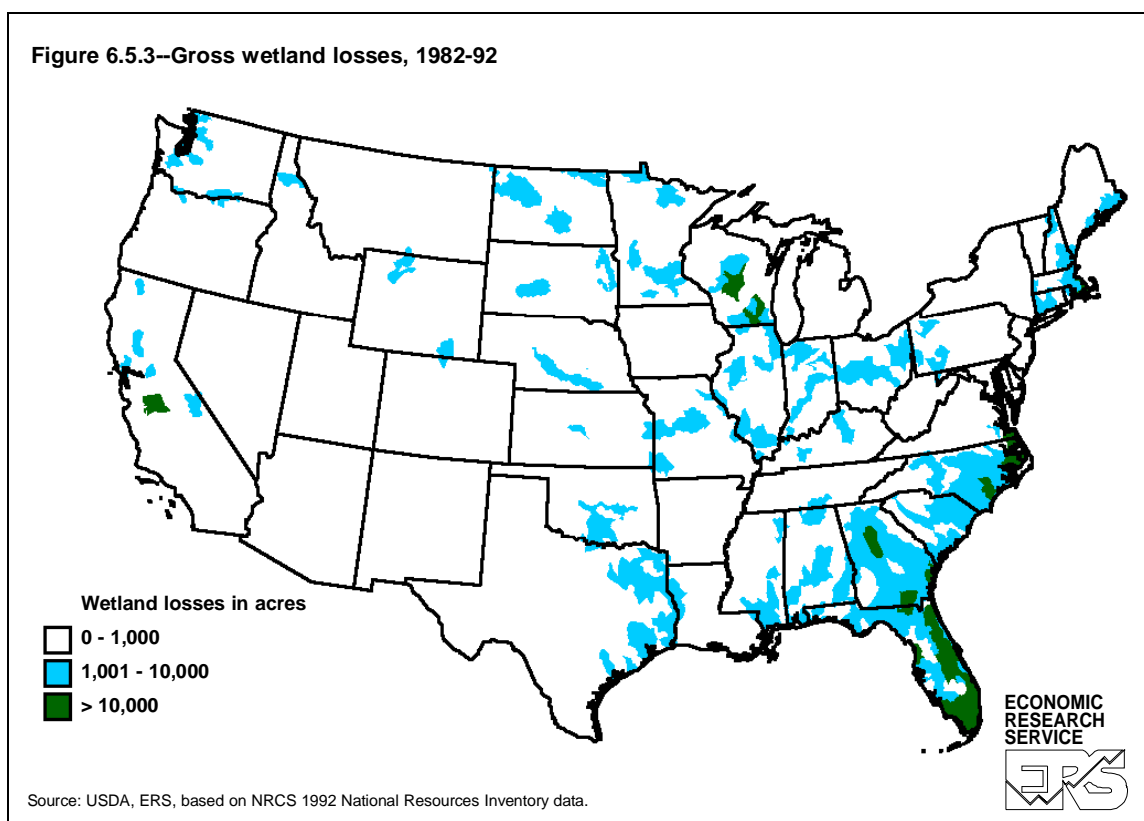
With wetland losses stemmed, wetland quality is now receiving greater attention. Wetland quality or function is determined by hydrologic functions (such as groundwater recharge, shoreline stabilization, flood peak reduction, tidal flows, and sediment accretion), nutrient supply functions (such as organic matter,

nutrient concentrations, and toxic metal concentrations), plant community characteristics and dynamics (dominant and sensitive species), and faunal community characteristics (arthropods, fish, aquatic invertebrates, birds, and mammals) relative to optimal levels in a fully functioning wetland of each type (NRC, 1992).

Methods have been developed to analyze wetland function, but they have not been systematically employed to indicate trends in wetland quality (Brinson, 1996; Adamus and Stockwell, 1983). However, changes in four factors—soil erosion, irrigation, forest cover, and urbanization—have potentially affected wetland quality and serve as indicators. In 1982-92, net reductions in erosion and irrigation in wetland watersheds probably had positive effects on wetland quality, while deforestation and urbanization likely had negative effects (table 6.5.3).<sup>2</sup>

<sup>2</sup> Gross changes at the watershed level have not been validated as indicators of actual change in wetland quality and cannot reflect subtleties of landscape position and hydrology that would increase or mitigate wetland degradation.

Figure 6.5.3—Gross wetland losses, 1982-92



Sediment from soil erosion can clog wetland vegetation and impair water holding capacity. In 1982-92, decreases in all sources of water-caused erosion were widespread, occurring in 63 percent of the 677 wetland watersheds (watersheds with at least 5 percent of area in wetlands). Watersheds with erosion decreases contained 61 million wetland acres in 1992, while those with erosion increases contained 14.4 million wetland acres. Land retired from production in the Conservation Reserve Program—along with widespread changes in agricultural production practices caused by less intensive rotations, adoption of conservation tillage, and implementation of conservation compliance provisions in the 1985 Food Security Act—accounted for the erosion reductions.

Increases in irrigation can degrade wetlands where diversions from natural watercourses rob wetlands and other instream uses of water or where groundwater pumping lowers water tables and dries out wetlands. Similarly, decreases in irrigated area or in diverted water could improve wetlands. More wetland watersheds experienced net decreases in irrigated acreage between 1982 and 1992 than had net increases, but the majority had no change. Some 23 million acres of wetlands occurred in watersheds that

had decreases in irrigated acres, and 15.8 million acres of wetlands were in watersheds where irrigated acreage increased. Watersheds with increases in irrigated acres are largely in humid areas where irrigation supplements natural precipitation. Supplemental irrigation may cause short-term stress on affected wetlands, but long-term damage is less likely.

Loss of tree cover, both from permanent land-use change and from normal harvesting of mature tree crops, can stress wetlands. Tree canopy protects watersheds from runoff and erosion and shades watercourses, lowering water temperatures for sensitive aquatic species. While some areas were planted to trees in 1982-92, development of tree canopy in a decade is usually insufficient to replace loss of mature tree cover. Nine out of 10 wetland watersheds lost forested acres between 1982 and 1992. The loss of tree cover reflects both purposeful harvest and incidental clearing of trees associated with changes such as urban and agricultural development. Forest harvest is likely the major cause of deforestation in the Southeast, northern New England, Minnesota and Wisconsin, and the Pacific. Tree clearing for urban development is likely a major

**Table 6.5.3—Indicators of potential change in wetland quality, contiguous States, 1982-92**

Indicator	Wetland watersheds <sup>1</sup>		Wetland area		Change in			
					Ero-sion	Irrigated area	Forest cover	Urban-ization
	Number	Percent	1,000 acres	Percent	Million tons	Million acres		
Water erosion								
Increased erosion may have degraded wetlands	88	13	14.4	15	3.8	0.1	-1.0	-1.0
Decreased erosion may have improved wetlands	429	63	61.0	64	-98.0	0.3	-3.1	-4.9
No change	160	24	20.1	21	0.0	0.1	-1.2	-1.1
Irrigated area								
Increased irrigation may have degraded wetlands	93	14	15.8	17	-17.6	1.3	-1.0	-1.4
Decreased irrigation may have improved wetlands	149	22	23.0	24	-21.4	-0.8	-1.3	-2.4
No change	435	64	56.7	59	-55.2	0.0	-2.9	-3.1
Forest cover								
Decreased cover may have degraded wetlands	587	87	87.1	91	-86.9	0.5	-5.3	-6.7
No change	90	13	8.4	9	-7.3	0.0	0.0	-0.3
Urbanization								
Increased urban area may have degraded wetlands	647	96	92.3	97	-92.8	0.4	-5.2	-7.0
No change	30	4	3.2	3	-1.4	0.0	0.0	0.0
Summary of the four indicators								
All indicate degraded wetland quality	19	3	3.6	4	0.6	0.2	-0.3	-0.4
Three indicate degraded, one no change	187	8	25.0	26	2.1	0.2	-1.5	-1.2
Three indicate degraded, one improved quality	300	44	42.8	45	-68.8	0.7	-2.5	-3.3
All indicators made no change	9	1	1.0	1	0.0	0.0	0.0	0.0
Two indicate degraded, two indicate improved	142	21	21.1	22	-25.5	-0.6	-0.9	-2.0
Three indicate improved, one degraded quality	18	3	1.8	2	-2.5	-0.1	0.0	-0.1
All indicate improved wetland quality	2	0	0.1	0	-0.1	0.0	0.0	0.0
Total wetland watersheds	677	100	95.5	100	-94.1	0.5	-5.3	-7.0

<sup>1</sup> Watersheds with 5 percent or more of total area in wetlands.

Source: USDA, ERS, based on 1992 National Resources Inventory data.

cause in southern New England, the mid-Atlantic, and Florida.

Urban development, measured by the change in urban land area between 1982 and 1992, can stress wetlands because of increased runoff from paved areas, toxic runoff from industrial pollutants and chemicals and oils deposited on roadways, and from trash and garbage dumped in wetland areas. Nearly all wetland watersheds (96 percent) had urban land increases, adding 7 million acres of developed land over the decade. Urbanization in wetland watersheds represented 48 percent of total U.S. urbanization. More extensive suburban development patterns may have less impact on wetlands than intensive development, particularly where zoning and floodplain management avoid loss of wetlands and riparian areas.

The four indicators together provide insight on the overall change in wetland quality from 1982 to 1992 (table 6.5.3). Mostly negative indicators suggest that many more watersheds declined in quality than improved. Watersheds with wetlands likely degrading in quality (all four indicators negative or unchanged) totaled 206, just over 30 percent of the 677 wetland watersheds. The majority of the remaining watersheds (300) had more negative than positive indicators, suggesting a possible decline in quality (though the net effects of the positive and negative factors are uncertain). In contrast, only 2 watersheds likely had improving wetland quality (all indicators positive or unchanged) and 142 possibly had improving quality (more positive than negative indicators).



Wetland Incentives and Programs

Landowners respond to a variety of economic and public policy factors that influence wetland conversion. The recent reduction in wetland losses is likely the cumulative effect of several important trends: (1) decline in the profitability of converting wetlands for agricultural production; (2) passage of the Swampbuster provisions in the 1985 and 1990 farm bills; (3) continued implementation of the Clean Water Act Section 404 program, as well as growth in State regulatory programs; (4) greater public interest and support for wetland protection and restoration; and (5) implementation of wetland restoration programs at the Federal, State, and local level.

Economic Factors

Economic factors have, over time, both encouraged and discouraged wetland conversion. Between 1954 and 1974, relatively stable net farm incomes and new drainage technology contributed to wetland conversion for agricultural uses, averaging 592,800 acres per year. Cropland acreage increased in Florida (21.9 percent), Arkansas (16.1 percent), North Dakota (8.7 percent), and Iowa (7.7 percent). The next period (1974-83) saw an overall decline in farm income, accompanied by price volatility caused by international market pressures. These economic conditions, along with wetland regulations, slowed conversion to 234,800 acres per year. In 1982-92, falling prices, lower farm incomes, high debt loads, and the Swampbuster provisions reduced agricultural wetland conversion to only 30,900 acres per year.

Government payments to farmers have influenced wetland conversion over time. In 1954-74, government payments increased the revenue received for the commodities produced on converted land, reduced risk by stabilizing prices and revenue, offered an incentive to increase crop acreage base, and required additional land for set-asides. In 1974-83, real direct government payments dropped to only 9 percent of net farm income and were almost zero when commodity prices spiked between 1974 and 1977. In 1982-93, government payments averaged 26 percent of net farm income, but program rules no longer allowed participants to expand their base acreage and payments were denied to producers who converted wetlands after 1985.

The economic cycle in the construction sector has also affected wetland conversions. In 1954-74, postwar stability and a sharp increase in construction activity in the early 1970's resulted in wetland conversion for urban purposes averaging 54,400 acres per year. In 1974-83, wetland conversion for

developed uses fell to only 14,000 acres per year. Wetland regulation under Section 404, which began in 1972, probably affected the construction industry more than it did agriculture because of construction's greater visibility, its greater familiarity to EPA and U.S. Army Corps of Engineers (ACE) regulators, and its proximity to EPA and ACE offices in urban areas. In addition, recovery in housing construction occurred more in the West and Midwest, resulting in less wetland conversion for the necessary land because of the less frequent occurrence of wetlands in those regions.

In 1982-92, new housing starts sustained a renewed rate of wetland conversion for developed uses averaging 88,600 acres per year, primarily in the South. The increased wetland conversion occurred despite a perceived tightening of wetland regulation under Section 404 and in State programs since 1987.

Similar levels of economic activity in agriculture and construction do not produce similar wetland conversion from one time period to another (table 6.5.4). Wetland losses to agriculture dropped from 12.6 acres for each million dollars of net farm income in 1954-74 to 0.9 acres in 1982-92 (Heimlich and Melanson, 1995). Wetland losses dropped from 30.2 acres per 1,000 housing starts in 1954-74 to only 8 acres in 1974-83, then rebounded to 49.4 acres per 1,000 starts in 1982-92. In part, these observed differences in conversion rates can be explained by differences in the regional distribution of activity, in the type and size of housing constructed, and in expectations of future profits when a sector is contracting versus expanding. However, wetland

Table 6.5.4—Wetland loss rates per unit of economic activity, contiguous States, 1954-92

Period	Average annual economic activity		Gross wetland loss per unit of economic activity	
	Net farm income	New private housing starts	Loss per \$ million of net farm income	Loss per 1,000 housing starts
	\$ billion (1987)	Million	Acres	
1954-74	47.5	1.8	12.6	30.2
1974-83	37.2	1.8	6.4	7.8
1982-92	34.0	1.7	0.9	49.4

Source: USDA, ERS, based on Heimlich and Melanson, 1995.

**Table 6.5.5—Swampbuster provision violations, 1987-93<sup>1</sup>**

Year	Producers in violation	Land in violation	Benefits denied
	<i>Number</i>	<i>Acres</i>	<i>\$ million</i>
1987	12	100	0.1
1988	127	1,490	1.2
1989	121	693	1.1
1990	105	560	1.3
1991	165	1,428	2.0
1992	156	3,221	1.6
1993	152	1,926	1.5
1994 <sup>2</sup>	97	1,027	1.4
1995 <sup>3</sup>	1	2	*
Total	936	10,447	10.2

<sup>1</sup> Includes producers and violating land for which price support or disaster benefits were denied. Benefits denied include price support payments, farm storage facility loans, crop insurance, and insured or guaranteed loans, but do not include a value for price support loans or disaster payments.

<sup>2</sup> Preliminary.

<sup>3</sup> Incomplete.

\* Less than \$100,000.

Source: USDA, ERS, based on FSA 1995 program data files.

regulatory programs increasingly mitigate conversion pressure arising from economic conditions.

### **Protection Programs**

Until 1978, some government programs encouraged conversion of wetlands to other uses by providing financial and technical assistance (see box, “Evolution of Agricultural Wetland Policy,” p. 319). A policy change toward preservation began in the late 1970’s, using disincentives and regulation to reduce conversion.

**Swampbuster.** Indirect Federal assistance for wetland conversion was eliminated by the Swampbuster provision (Title XII C. P.L. 99-198) of the Food Security Act of 1985. The Swampbuster provision made a farm operator ineligible for price support payments, farm storage facility loans, crop insurance, disaster payments, and insured or guaranteed loans for any year in which an annual crop was planted on converted wetlands. Persons sanctioned for Swampbuster violations increased from only 12 in 1987 to 165 in 1991, but have dropped since then (table 6.5.5). Despite intensive debate, few changes were made to Swampbuster provisions in the 1996 Federal Agriculture Improvement and Reform Act.

**Section 404 Permits.** Wetland conversion is directly regulated by the U.S. Army Corps of Engineers and the Environmental Protection Agency, under Section

**Table 6.5.6—Permit actions under section 404 of the Clean Water Act, FY 1994**

Action	Number	Percent
General permits issued	39,619	82.0
Standard permits issued	3,760	7.8
Letters of permission issued	374	0.8
Applications withdrawn	4,184	8.7
Permits denied	358	0.7
Total applications	48,292	100.0

Source: USDA, ERS, based on U.S. Army Corps of Engineers, 1995.

404 of the Clean Water Act. Few permit applications under section 404 are actually denied. In fiscal year 1994, the Corps received 48,292 permit applications (table 6.5.6). Of these, 43,753 (91 percent) were authorized through general permits, standard permits, or letters of permission (affecting 17,200 acres); 4,184 (9 percent) were withdrawn (about half of which qualified for general permits, administrative adjustments, or were not required); and only 358 (less than 1 percent) were denied. The Corps estimates that an additional 50,000 activities are authorized each year by general permits that do not require the public to notify the Corps. Of 2,454 enforcement cases in FY 1994, only 70 (3 percent) involving the most egregious circumstances resulted in litigation or administrative penalties (U.S. Army Corps of Engineers, 1995).

Permits for agricultural activities were only 6.7 percent (3,430) of total permits considered in FY 1994. Of these, 87.5 percent were general permits, 11.7 percent were special permits, and 0.9 percent (30 permits) were denied. More than half of the agricultural activities that do require permits involve conversion of wetlands to developed uses. The vast majority of agricultural activities are covered by Section 404 (f) exemptions that preclude permits for “normal” farm activities such as plowing, seeding, cultivating, and harvesting. Most other activities associated with farming are also exempt as long as woody vegetation, if any, is not disturbed.

The Corps has been working to reduce permit evaluation time. While the number of permit actions increased 27 percent in 1990-94, average permit evaluation times dropped by 14 percent. General permit applications took an average of 16 days to process in FY 1994, while denied permits required an average of 164 days, for an overall average processing time of 27 days.



**Table 6.5.7—Wetland Reserve Program results, by State, 1992-96**

State <sup>1</sup>	Applications received		Applications enrolled	
	Number	Acres	Number	Acres
Louisiana	553	127,549	187	61,912
Mississippi	389	111,044	130	57,872
Arkansas	556	104,542	103	28,883
Missouri	1,005	92,324	198	23,306
Iowa	310	19,887	211	15,860
California	415	169,338	44	15,561
Oklahoma	141	41,676	23	12,777
North Carolina	54	10,725	28	10,725
Wisconsin	164	10,940	134	9,935
Texas	87	73,618	13	9,021
Oregon	33	12,134	17	8,277
South Dakota	149	10,670	84	5,913
Illinois	216	21,136	66	5,795
Tennessee	189	21,328	24	5,746
Nebraska	261	23,655	39	5,111
Minnesota	379	23,629	56	4,493
Washington	105	8,869	23	4,072
Kansas	80	5,834	44	3,894
Indiana	597	25,287	61	3,426
New York	154	7,446	58	3,192
Ohio	350	13,000	62	2,882
Montana	11	2,819	7	2,499
South Carolina	120	7,500	18	2,333
Georgia	115	15,682	4	2,005
Michigan	82	3,191	34	1,995
Maryland	16	1,693	12	1,483
Kentucky	187	16,830	9	1,420
Alabama	89	3,500	6	919
Colorado	28	1,040	10	725
Alaska	1	626	1	626
Virginia	140	21,000	16	623
Pennsylvania	35	1,000	19	516
Maine	11	1,000	3	500
Vermont	43	781	6	200
New Jersey	7	320	2	195
Connecticut	5	341	3	112
New Hampshire	24	103	3	103
Idaho	13	700	2	102
Wyoming	13	2,450	4	84
Delaware	6	52	3	52
Massachusetts	14	310	2	30
Utah	5	3,370	0	0
U.S. total	7,152	1,018,938	1,769	315,175

<sup>1</sup> Ranked in order of acres enrolled. No applications received from Arizona, Florida, Hawaii, Nevada, New Mexico, North Dakota, Rhode Island, and West Virginia.

Source: USDA, ERS, based on NRCS, 1996 (program data summary)

**Table 6.5.8—Emergency Wetlands Reserve Program results, by State, 1993-1996**

State	Applications received		Applications enrolled	
	Number	Acres	Number	Acres
Iowa	645	57,551	330	36,744
Missouri	496	65,275	128	21,927
South Dakota	152	15,850	81	9,904
Illinois	33	12,736	20	5,651
Minnesota	85	3,000	27	2,241
North Dakota	18	1,500	2	235
Kansas	5	146	4	142
Nebraska	13	233	4	55
Total	1,447	156,291	596	76,929

Source: USDA, ERS based on NRCS, 1996 program data files.

### Restoration Programs

Restoration programs include activities to restore prior converted wetlands, enhance wetland function on existing degraded wetlands, and buffer wetlands from surrounding cropland uses.

**Wetlands Reserve Program.** Restoration of wetlands gained momentum in 1990 with establishment of the Wetlands Reserve Program (WRP). WRP has a goal of restoring 975,000 acres to wetlands by 2002. In the 1996 Farm Act, Congress reaffirmed the enrollment goal and required one-third of enrollments each in 30-year easements, cost-share agreements, and permanent easements. Farmers often express reluctance to cede rights to cropland permanently, and are generally more favorable toward shorter obligations (SWCS, 1994). The WRP program funds USDA to restore wetlands and purchase permanent or long-term easements to restrict agricultural use of the restored wetland. The landowner is allowed certain economic uses of the restored wetland that may reduce the cost of the easement. These uses include hunting, fishing, or other recreational activity, grazing during prescribed times, and selective timber harvesting that is compatible with wetland restoration. The landowner is paid up to 75 percent of the cost of restoring the former wetland.

Following successful WRP enrollments in 1992, 1994, and 1995, Congress appropriated \$77 million in FY 1996 to retire more than 100,000 acres of cropland and restore them to wetlands. As of September 1996, USDA enrolled 315,175 acres from 1,769 landowners in nearly every State, out of more than a million acres offered (table 6.5.7). Expanding from 9 pilot States in 1992 to 20 States in 1994, WRP

## Evolution of Agricultural Wetland Policy

### *Encouraging Wetland Drainage, 1780-1977*

**Early Encouragement 1780-1940**—For the first 200 years of U.S. history, the Federal Government approved of and assisted with wetland drainage to further public health and economic development goals. Between 1849 and 1860, the **Swampland Acts** granted 64.9 million acres of wetlands to 15 States on the condition that proceeds of wetlands sold to individuals be used for reclamation projects. States also encouraged wetland drainage by passing legislation enabling creation of local drainage districts (Pavelis, 1987).

**Agricultural Conservation Program (ACP), Great Plains Conservation Program (GPCP), and Conservation Technical Assistance (CTA), 1940-77**—Cost-sharing and technical assistance for open ditch and tile drainage were used on some 57 million acres of wet farmland, including many wetlands. However, in response to Executive Order 11990 in 1977, USDA prohibited further use of ACP and GPCP cost-sharing for tile or surface drainage, except under limited circumstances.

**Small Watershed Program, 1944-1977**—Funds for flood control and drainage structures were provided under PL-566 and the PL-534 Flood Control Act. Construction of outlet channels under PL-566 provided drainage outlets for increased farm drainage in wetland areas. In 1977, USDA changed the programs in response to Executive Order 11990 to limit direct impacts on wetlands.

### *Encouraging Wetland Preservation, 1970 to present*

**Water Bank Program, 1970**—In return for annual per-acre payments, landowners agreed not to burn, drain, fill, or otherwise destroy the character of enrolled wetland areas. Existing Water Bank contracts were terminated after 1990, but landowners could enroll in the Wetland Reserve Program.

**Section 404, Federal Water Pollution Control Act Amendments, 1972**—The only Federal program regulating wetland conversion is Section 404 dredge and fill permit requirements enacted in the 1972 Federal Pollution Control Act amendments, now called the Clean Water Act.

**Food Security Act (FSA), 1985**—Indirect Federal assistance for agricultural wetland conversion was eliminated by the wetland conservation provisions (**Swampbuster**) of the 1985 FSA. The Swampbuster provision was a quasi-regulatory policy that made a farm operator ineligible for price support payments, farm storage facility loans, crop insurance, disaster payments, and insured or guaranteed loans for any year in which an annual crop was planted on wetlands converted after 1985. In 1989, **Conservation Reserve Program (CRP)** eligibility was expanded to include wetland that had been cropped for at least two years between 1981 and 1985, but had not been drained.

**Tax Reform Act, 1986**—This Act restricted or eliminated many provisions that indirectly subsidized agricultural wetland conversion. Among these were deductions for land clearing expenses, deductions for soil and water conservation expenses, and preferential treatment of capital gains, including capital gains realized from draining wetlands.

**Food, Agriculture, Conservation, and Trade Act (FACTA), 1990**—In addition to some adjustments to the Swampbuster provision, this act authorized a **Wetland Reserve Program (WRP)**. The Act called for restoration of 1 million acres of cropland to wetlands, requiring permanent or long-term easements with the landowner to restrict agricultural use of restored wetland.

**Bush Administration Wetlands Plan, 1991**—Plan for accelerated regulatory reform, followed shortly by the 1991 inter-agency wetland delineation manual, substantially revised the 1989 manual. Little progress was made in implementing the Bush plan.

**Clinton Administration Wetlands Plan, 1993**—An interagency task force led by the new Council on Environmental Quality crafted their own wetland regulatory reform package that embraced the “no net loss” of wetlands goal, streamlined Section 404 permit processing, gave NRCS authority for wetland delineation on agricultural land, and supported wetland restoration through a variety of programs, including WRP.

**Federal Agriculture Improvement and Reform Act (1996 Farm Act)**—Continued the Wetland Reserve Program with a goal of 975,000 acres and required that, beginning October 1, 1996, one-third of total program acres be enrolled in permanent easements, one-third in 30-year easements, and one-third in restoration only cost-share agreements. Made changes to give farmers more flexibility, including expanding areas where mitigation can be used, providing more options for mitigation, and encouraging effective and timely use of “minimal effect” determinations. Wetland conversion activities, authorized by a permit issued under Section 404 of the Clean Water Act, which make agriculture production possible, will be accepted for farm bill purposes if they were adequately mitigated. The concept of “abandonment” was revised to ensure that Prior Converted designations remain as long as land is used for agriculture. A pilot program for wetland mitigation banking was established. Wetlands are once again eligible for enrollment in CRP.

**Table 6.5.9—Wetland enhancement and restoration activity, 1987-95<sup>1</sup>**

Program	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
<i>Thousand acres</i>										
Partners for Wildlife	2	16	37	42	41	38	35	32	na	243
NAWMP <sup>2</sup>	--	--	38	65	98	88	51	50	na	390
Conservation Reserve	0	0	410	0	0	0	0	0	0	410
Wetland Reserve	--	--	--	--	--	42	0	144	116	302
Emergency WRP	--	--	--	--	--	--	25	0	31	57
Section 404	na	na	na	na	na	na	na	15	38	53
Total	2	16	485	107	139	168	111	241	185	1,455

na = not available

<sup>1</sup> Includes acres of wetlands restored from prior conversion, enhancements of existing degraded wetlands, and upland buffers.

<sup>2</sup> NAWMP = North American Waterfowl Management Plan.

-- = Plan or program not in effect.

Source: USDA, ERS, based on Tolman, 1995; USDA, FSA, 1995; U.S. Army Corps of Engineers, 1995.

operated nationwide in 1995 and 1996. Louisiana and Mississippi enrolled over 50,000 acres each, followed by Arkansas, Missouri, Iowa, California, Oklahoma, and North Carolina with more than 10,000 acres each. No land was enrolled in Florida nor in urbanized States like Rhode Island and Hawaii or in arid States like Arizona, New Mexico, and Utah.

WRP enrollment rose from 43,356 acres in 1992 to 196,747 acres in 1995/96. The average cost of enrollments is \$680 per acre; costs range from more than \$1,500 per acre in Massachusetts, Missouri, and New Hampshire to less than \$500 per acre in Georgia, Minnesota, Oklahoma, South Dakota, Colorado, and Maine.

***The Emergency Wetlands Reserve Program (EWRP)*** was established in 1993, using funds from the Emergency Watershed Protection Program authorized under emergency supplemental appropriations after the Midwest flood. The voluntary program helped landowners convert flood-damaged cropland to wetlands if the cost of the levee restoration and cropland renovation exceeded the value of the land. To date, more than 75,000 acres have been enrolled for restoration to wetlands in eight Midwestern States (table 6.5.8), mostly in Iowa and Missouri. Easement and restoration costs totaled \$63 million, or about \$800 per acre enrolled.

***The U.S. Fish and Wildlife Service's Partners for Wildlife*** negotiated voluntary, nonbinding agreements with landowners to share the cost of restoring more than 240,000 acres to wetlands since 1987 (table 6.5.9). A related program of joint ventures with State and local governments and private organizations such

as Ducks Unlimited and the Isaak Walton League under the North American Waterfowl Management Plan has restored and enhanced almost 400,000 acres since 1989. As discussed above, WRP and EWRP account for more than 390,000 acres of wetland restoration since 1992. CRP put more than 400,000 acres under 10-year contracts in 1989, many of which have been fully restored as functional wetlands. Finally, mitigation requirements under Section 404 restored more than 50,000 acres in 1993 and 1994. Additional mitigation has occurred since 1987, when the Corps adopted guidelines specifically requiring mitigation, but no data are available on restorations earlier than 1993.

### **Impacts of Proposed Changes to Wetland Programs**

Congress proposed a number of changes to current wetlands programs. Proposed restrictions on programs affecting property rights would heavily impact wetland protection programs. In addition, direct changes in wetland protection and restoration programs have been proposed, including extensive changes to how wetlands are delineated. The focus on floodplain management deriving from the extensive flooding in 1993 is also stimulating proposals for change.

### **Section 404 Permit Program Changes**

Some of the most vigorous debate over private property rights reform focuses on the section 404 permit program of the Clean Water Act (see box, "The Private Property Rights Issue," in chapter 1.2, *Land Tenure*). As a regulatory program, section 404 is potentially vulnerable to "takings" compensation claims. Few permit denials under section 404 lead to

takings claims filed against the Federal Government, and even fewer result in compensation. As of May 31, 1993, only 28 cases involving takings claims had been filed with the U.S. Court of Federal Claims (Claims Court) as a result of a regulatory action under the section 404 program (U.S. General Accounting Office, 1993a). Ten of these cases were decided in favor of the Federal Government, 3 were decided in favor of the claimant, 1 was settled before a decision was rendered, and 14 were still pending as of May 31, 1993. Since 1993, over 30 new takings cases have been filed under the section 404 program (Rugiel, 1996). As of December 31, 1994, three more cases had been decided, two of which were found to involve takings (Meltz, 1995). As of May 1993, the Government had paid compensation in only two cases—a case settled out of court and one of three cases decided in favor of the claimant. The Government has appealed the Claims Court's decisions in the other two cases.

Despite the low number of claims filed thus far, legislating compensation requirements would likely increase claims compensation liability. The Congressional Research Service estimated that compensation on almost 9 million acres would be required under changes to Section 404 in H.R. 1330, at a cost of \$10.7 billion (CRS, 1992). Compensation exposure was estimated by the Council of Economic Advisors for a more recent proposal (H.R. 3875) at between \$48 and \$499 billion, depending on the assumed rate of conversion. ERS estimates of compensation payable under H.R. 925 for diminution in value of wetlands because of Swampbuster provisions range from \$705 million to \$1.4 billion.

In addition to compensation proposals, the 104th Congress considered other changes to Section 404 wetland regulation as part of Clean Water Act reauthorization amendments. Passed by the House, H.R. 961 requires that land be inundated for at least 21 consecutive days during the growing season to be considered wetlands, exempts small wetlands, and offers full protection only to those wetlands deemed most ecologically significant, requiring compensation for any loss in value of 20 percent or more. Senate Bill 851, introduced in May 1995, contains many of the House provisions, including similar delineation criteria, but has broader exemptions, especially for wetlands on cropland. Action on Clean Water Act reauthorization was not completed in the Senate. Remaining Section 404 protections against wetland conversion could become more important as reductions in commodity program payments reduce the incentive to comply with Swampbuster provisions.

Environmental critics of these proposals focus on the large acreage of currently regulated wetlands that could potentially be lost if the delineation criteria that exempt drier wetlands are accepted. While some environmentalists press a more comprehensive, ecosystem-based regulatory approach, others view the proposed legislation as an excessive reaction to problems that can be dealt with administratively (Franco, 1995; Goldman-Carter, 1995).

### **Swampbuster Changes**

In contrast to Section 404, the Swampbuster provision is a condition on voluntary participation in Federal programs, and as such is not vulnerable to takings claims under current law. Nevertheless, legislation currently being considered in the 104th Congress would require compensation for diminution in property values due to both section 404 and the Swampbuster provision (see box, "The Private Property Rights Issue," in chapter 1.2, *Land Tenure*).

Two proposals for relaxing Swampbuster provisions were considered during the first session of the 104th Congress. Both proposals would redefine wetlands to reduce the acreage on which drainage would trigger Swampbuster sanctions. Consistent with proposed changes to Section 404, areas subject to Swampbuster would be limited to those typically covered with water (ponded or flooded) for 21 consecutive days during the growing season. Current law requires only that the soil be saturated within 18 inches of the soil surface for 7 consecutive days during the growing season. An estimated 71 million acres would be exempted from Swampbuster provisions under the 21-day criterion, about 82 percent of wetlands currently covered by Swampbuster (fig. 6.5.4). Two-thirds of exempted wetland is currently forested, 13 percent is marshland, while another 18 percent is split evenly between pasture and rangeland. The second proposal, the *cropped wetlands exemption*, would remove Swampbuster sanctions from 6 million acres of wetlands already used for crop production (fig. 6.5.5).

Based on expected crop prices and conversion and production costs, ERS estimated how much of the acreage that would be exempted under these proposals would be profitable to convert to crop production. Under the 21-day criterion and cropped wetland exemptions, drainage is estimated to be profitable on more than 9 million of the 71 million acres of exempted wetlands, more than half of which is located in 5 Southern States: North Carolina (16 percent), Arkansas (13 percent), Georgia (9 percent), Mississippi (7 percent), and Texas (6 percent).

Figure 6.5.4--Wetlands that would be exempted under 21-day proposal

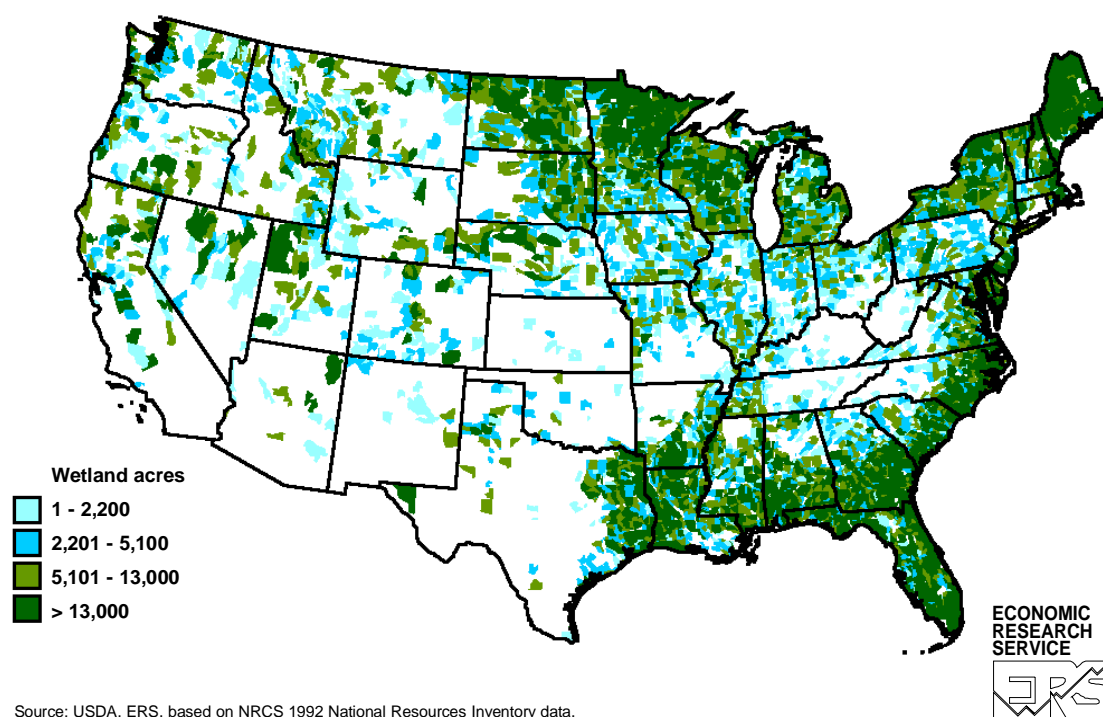
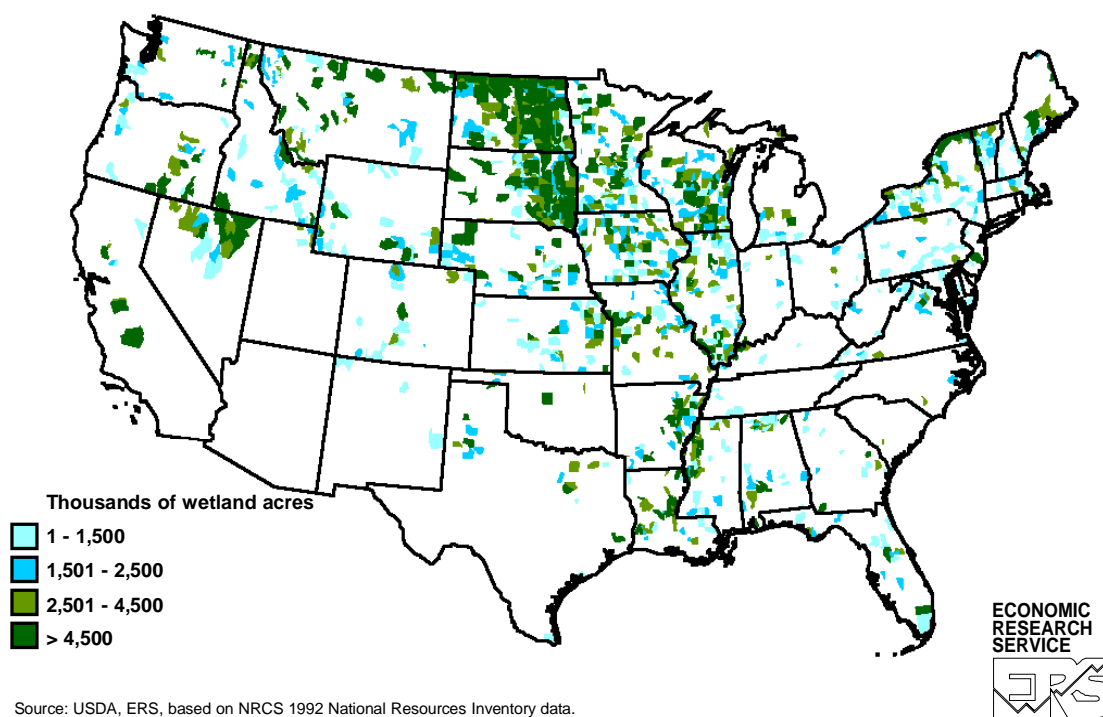


Figure 6.5.5--Wetlands used in crop production, 1992



**Table 6.5.10—Effects of proposed wetland exemptions on planted acreage, by region**

Effects of proposed wetland exemptions on planted acreage, by region					
Region	Baseline crop acreage <sup>1</sup>	Short run		Long run	
		21-day criterion	Cropped wetlands exemption <sup>2</sup>	21-day criterion	Cropped wetlands exemption <sup>2</sup>
Million acres					
Northeast	12.3	0.3	**	0.2	**
Lake State	34.8	0.6	0.1	0.1	**
Corn Belt	84.5	1.5	0.1	0.3	**
Northern Plains	71.5	0.6	0.2	-0.3	**
Appalachia	18.5	1.6	**	1.1	**
Southeast	9.6	1.9	**	1.3	**
Delta States	18.3	2.5	0.1	1.9	0.1
Southern Plains	35.6	0.3	**	**	**
Mountain States	26.3	0.1	**	**	**
Pacific Coast	11.9	**	**	**	**
Total	323.4	9.5	0.7	4.8	0.2

\*\* Fewer than 50,000 acres.

<sup>1</sup> Baseline acreage for commodities in USMP projected for 2001 from *Long-term Agricultural Baseline Projections, 1996-2006*. August 1995.

<sup>2</sup> Cropland acreage equivalents from improving drainage on land already in crop production.

Source: USDA, ERS, based on analysis of 1992 National Resources Inventory data.

Almost all of the cropped wetlands could be further drained for profitable crop production or to remove wetlands hindering farm operation. Because they are already cropped, further drainage of cropped wetlands adds fewer acreage equivalents to production than for newly converted wetlands.

The economic effects of bringing profitable exempted wetlands into production were estimated by ERS using the U.S. Regional Agriculture Sector Model (USMP). In the short run, producers are assumed to act on observed market prices and drain all wetlands where crop production is estimated to be profitable. After longrun adjustments, not all of the wetland acreage drained initially would be kept in production. For both shortrun and longrun scenarios, the estimated net effect of both wetland exemptions is increased planted acreage and production and lower prices. While farmers with acreage to drain may profit from increased production and sales, net cash returns to the farm sector would decline because of lower prices.

In the short run, under the 21-day criterion, soybean acreage would increase in the Delta States, Southeast, and Appalachia (table 6.5.10). The cropped wetlands exemption would increase wheat production in the prairie pothole region of the Northern Plains and soybean production on partially converted, formerly forested wetlands in the Delta States. After longrun adjustments, adoption of these proposed exemptions

would increase planted acreage by only half the shortrun increase. Expected declines in net cash incomes would be greatest in the Corn Belt, the Northern Plains, and the Lake States, while increases in net cash income would occur in the Southeast and Delta regions (table 6.5.11). Overall, net cash returns would fall in both the short and long run, but producers in the Southeast, Delta, and Appalachian regions would benefit from increased production more than they lose from reduced prices.

Even though the 1996 Farm Act made few explicit changes to Swampbuster provisions, changes in commodity provisions will reduce Swampbuster's effectiveness in discouraging wetland conservation. The Act decouples farm program payments from current market conditions and phases payments down over 7 years. While the market transition payment still requires compliance with Swampbuster provisions, the disincentive to conversion is reduced proportionally as the payment declines. A producer with many acres of wetlands that could be profitably converted to or further drained for crop production at expected prices may forego commodity program participation when the loss of remaining farm program payments becomes smaller than the potential gain from conversion.

### ***Floodplain Management Changes***

Levees built to constrain rivers from their natural floodplains also have resulted in loss of wetlands, loss

**Table 6.5.11—Effects of proposed wetland exemptions on net cash income, by region**

Table 10.17: Effects of proposed wetland exemptions on net cash income, by region					
Region	Baseline net cash income <sup>1</sup>	Short run		Long run	
		21-day criterion	Cropped wetlands exemption <sup>2</sup>	21-day criterion	Cropped wetlands exemption <sup>2</sup>
\$ million					
Northeast	4,108.6	-90.0	-7.6	-47.9	-2.0
Lake States	9,019.6	-588.1	-61.9	-255.2	-10.9
Corn Belt	20,232.4	-2,440.4	-255.6	-908.6	-68.8
Northern Plains	9,897.6	-920.3	-86.0	-405.1	-11.3
Appalachia	2,978.6	-69.4	-14.0	12.0	-4.9
Southeast	2,097.8	43.2	3.8	36.0	0.1
Delta States	4,285.0	-18.4	2.2	13.1	2.0
Southern Plains	6,148.7	-194.9	-19.7	-114.3	-8.0
Mountain States	3,876.8	-142.4	-9.0	-78.0	-3.3
Pacific Coast	5,796.3	-88.6	5.0	-72.1	6.7
Total	68,441.4	-4,309.3	-442.8	-1,816.5	-100.4

<sup>1</sup> Base income for commodities in USMP projected for 2001 from *Long-term Agricultural Baseline Projections, 1996-2006*. August 1995. Does not include deficiency payments.

Source: USDA, ERS, based on analysis of 1992 National Resources Inventory data.

of natural flood storage, and acceleration and amplification of flood flows and flood peaks. In 1993, rainfall that was unusual in both extent and duration resulted in ground saturation and flooding in the Midwest, causing widespread damage and raising questions about whether reliance should be reduced on levees and other flood control structures and whether floodplains should be returned to natural wetlands. As an alternative to restoring flood-damaged levees, the Emergency Wetlands Reserve Program was established in 1993 to help landowners convert flood-damaged cropland to wetlands if the cost of the levee restoration and cropland renovation exceeded the value of the land. Flooding in Georgia (in 1994), California (in 1995), and the mid-Atlantic States and Pacific Northwest (1996) raised further questions about appropriate floodplain management.

The White House Interagency Floodplain Management Review Committee (IFMRC), set up in 1994, found that loss of wetlands and upland cover (primarily to agricultural uses) had significantly increased runoff over the past century and a half, but that wetland restoration would have had little impact on conditions in 1993 (IFMRC, 1994a and 1994b). Economic damage estimates ranged from \$12-16 billion, of which over half was accounted for by agriculture. As of June 1994, USDA emergency assistance paid to the nine Midwestern States most severely affected totaled \$2.9 billion, most of it for disaster assistance and crop insurance (USDA Flood Information Center, 1994).

Despite the magnitude of losses in 1993, the IFMRC found that reservoirs and levees built by the U.S. Army Corps of Engineers worked essentially as designed, preventing more than \$19 billion in potential damages. Watershed projects built by the Natural Resources Conservation Service (previously the Soil Conservation Service) were estimated to have prevented potential damages totaling an additional \$400 million. However, they also found that nonstructural solutions—such as permanent evacuation of floodprone areas, flood warning, floodproofing of structures, and creation of additional natural and artificial flood storage—need greater emphasis.

Based on its findings, the IFMRC recommended a variety of administrative and legislative steps, improved coordination of Federal acquisition of environmentally related interests in land from willing sellers (see box, “Floodplain Restoration in Louisa County, Iowa”), and reforms to enhance the efficiency and effectiveness of the National Flood Insurance Program. The National Flood Insurance Reform Act of 1994 restricts lending secured by uninsured or underinsured property located in floodplains, extends the waiting period before new flood insurance policies become effective from 5 to 30 days, and denies Federal disaster assistance to individuals who failed to obtain and maintain flood insurance when required to do so as a condition for receiving disaster assistance.



## Floodplain Restoration in Louisa County, Iowa

Levee District 8 covers 3,000 acres of Iowa River floodplain in southeastern Iowa's Louisa County. Prior to 1993, the district had received Federal funds to repair flood-damaged levees 14 times, at a cost of nearly \$4 million (in 1993 dollars). The 1993 floods caused a further \$757,000 in levee damage (Dettman, 1994). Rather than repair the levees again, the district's board voted in March 1994 to discontinue agricultural operations and disband the district.

As a result of an agreement among landowners, State and Federal agencies, and private conservation organizations, most of the land formerly protected by the district's levees is being reclaimed as part of the Iowa River's natural floodplain and restored to bottomland hardwood forest. The agreement is being implemented through a variety of integrated land acquisition efforts. Most of the district's landowners granted permanent easements to the Federal Government under the Emergency Wetlands Reserve Program (EWRP). Other interests in land, including residual interests in EWRP land, are being purchased by the U.S. Fish and Wildlife Service and by private conservation organizations. In addition to providing wildlife habitat, recreation, and educational opportunities, restoration will ease flooding downstream. The area will be maintained by the Fish and Wildlife Service as part of the Mark Twain National Wildlife Refuge (Wiebe, Kuhn, and Tegene, 1996).

The Midwest floods also prompted a review by the U.S. General Accounting Office (GAO) of how well Federal levees performed in 1993. Citing data from the Corps of Engineers, GAO reported that 157 (81 percent) of the 193 Corps levees located in the flood-affected area prevented severe flooding on about 1 million acres and over \$7 billion in damages (GAO, 1995). Of 181 levees for which data were available, 177 performed up to their design capacity: 145 kept floodwaters out of the protected floodplain and 32 were overtopped when the flood exceeded their design capacity. Only 4 Corps levees failed prior to being overtopped. The Corps estimates damage from flooding on about 400,000 acres behind the 36 levees that were breached or overtopped at \$450 million. By contrast, the Corps estimates that about 1,100 (81 percent) of the 1,358 nonfederal levees in the flood area failed in 1993.

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## Recent Reports on ERS Research on Wetland Issues

**"Proposed Delineation Changes for Wetlands."** *Journal of Soil and Water Conservation* (1996) 51 (5): 402-407. Sept/Oct. (Keith Wiebe, Ralph Heimlich, and Roger Claassen). This article estimates potential wetland conversion from exempting wetlands from Swampbuster provisions, as discussed during the 1996 Farm Bill debate. Short- and long-term economic impacts of exempting 71 million acres of wetlands are estimated based on the profitability of conversion and economic adjustments to increased acreage in production.

**"Wetlands Lost, Wetlands Gained."** *National Wetlands Newsletter*, (1995) 17(3):1,23-25 (Ralph Heimlich and Jeanne Melanson). This article presents estimates of wetland losses and gains from the 1992 National Resources Inventory and argues that wetland regulatory policies, restoration programs, and economic conditions resulted in nearly achieving the "no net loss" of wetlands goal during the 1980's.

**"Property Rights, Partial Interests, and the Evolving Federal Role in Wetlands Conversion and Conservation,"** *Journal of Soil and Water Conservation*, (1995) 50(6):627-629. Nov.-Dec. (Keith Wiebe, Abebayehu Tegene, and Betsey Kuhn). This article examines the nature of land ownership, the evolving Federal role in wetland use and conservation, and property rights reforms proposed in the 104th Congress. Particular attention is given to the evolution of Federal wetlands policies.

***Partial Interests in Land: Policy Tools for Resource Use and Conservation.*** AER-744, Nov. 1996. (Keith Wiebe, Abebayehu Tegene, and Betsey Kuhn). This report examines the nature of land ownership and the evolving Federal role in land use and conservation. Particular attention is given to the ways in which conservation easements and other partial interests in land are acquired in farmland protection programs, the Conservation Reserve Program, and the Wetlands Reserve Program.

(Contact to obtain reports: Ralph Heimlich, (202) 219-0431 [heimlich@econ.ag.gov])

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